

The Advanced Thermal Emission and Reflection Radiometer, ASTER

Anne B. Kahle
Jet Propulsion Lab
California Institute of Technology
4800 Oak Grove Dr.
Pasadena, CA 91109, USA

Yasushi Yamaguchi
Nagoya University
Furo-cho, Chikusa-ku
Nagoya, JPN

Hiroji Tsu
Geological Survey of Japan
1-1-3 Higashi
Tsukuba, JPN

ASTER, now in orbit on Terra, has been provided by the Japanese Ministry of International Trade and Industry (MITI). It creates high-spatial-resolution (15-90m) multispectral images of the Earth's surface and clouds in order to help monitor and understand the physical processes that are occurring which affect climate and land surface change. While MODIS and MISR monitor many of the same variables globally on a daily basis, ASTER provides data at a scale that can be directly related to detailed physical processes. These data help bridge the gap between field observations and the data acquired by MODIS and MISR, and between process models and climate and forecast models. ASTER data can be used to help establish a baseline for long-term monitoring of local and regional changes on the Earth's surface, which either lead to, or are in response to, global climate change, e.g., land use, deforestation, desertification, lake and playa water level changes, changes in vegetation communities, glacial movements, and volcanic processes.

ASTER has three visible and near-infrared (VNIR) channels between 0.5 and 0.9 micrometers with 15 m resolution, six short-wave infrared (SWIR) channels between 1.6 and 2.43 micrometers, and five thermal infrared (TIR) channels between 8 and 12 micrometers, with 90 m resolution. An additional, backward pointing, VNIR telescope provides along-track stereo coverage at 15m resolution. For further details on ASTER, how to acquire existing data and how to request future data acquisition, see the ASTER website at <http://asterweb.jpl.nasa.gov>.

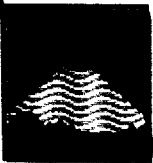
The Advanced Thermal Emission and Reflection Radiometer, ASTER

**Anne B. Kahle
Yasushi Yamaguchi
Hiroji Tsu**



ASTER Instrument Overview

- **ASTER is an international effort:**
 - **Japanese government is providing the instrument under MITI (Ministry of International Trade and Industry) and is responsible for Level 1 data processing**
 - **Science team consists of Japanese, American and Australian scientists**



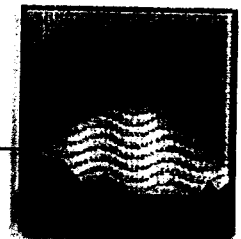
ASTER is the only EOS AM1 imaging instrument with high spatial resolution. It will be used synergistically with MODIS, MISR and CERES which monitor the Earth at moderate to coarse spatial resolution. The ASTER capability to serve as a 'zoom' lens for the other instruments is particularly important for change detection, process studies, and calibration/validation.

During its 5-year mission, ASTER will obtain data for:

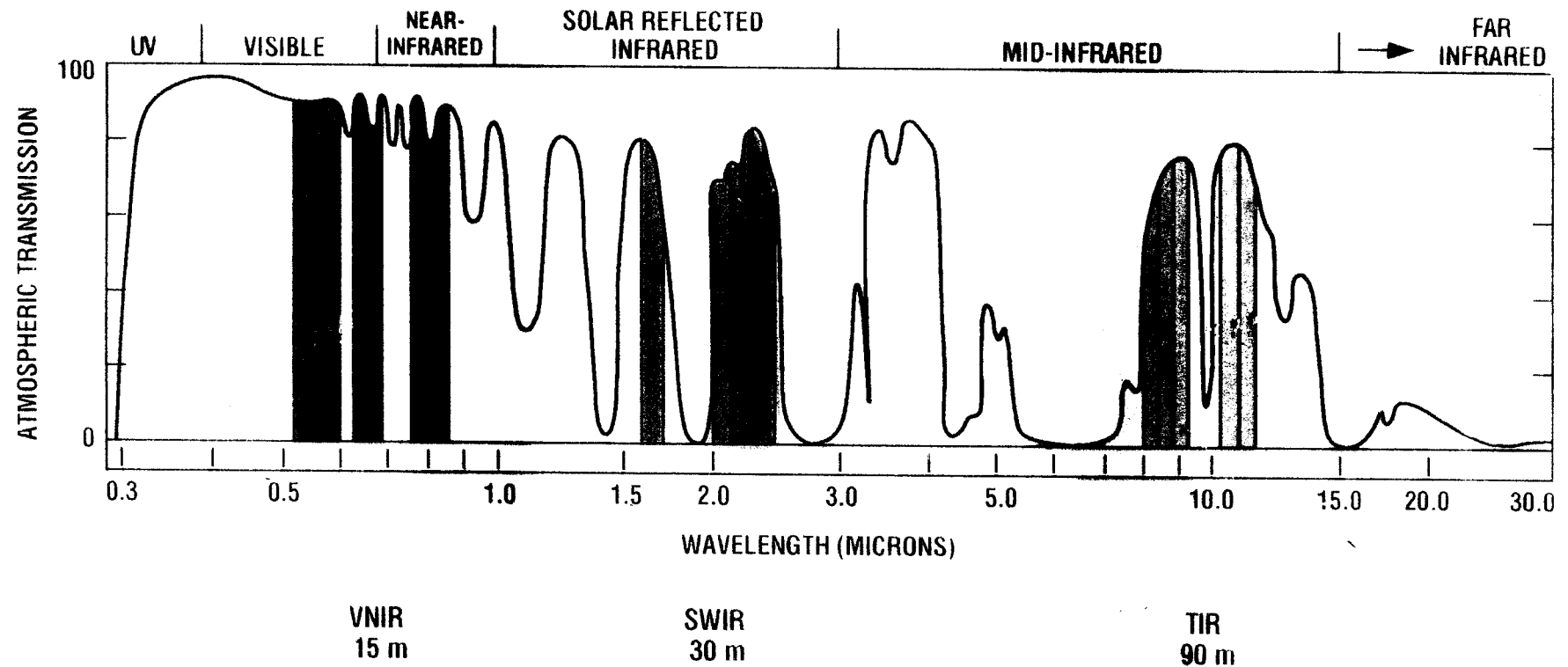
- a global land map • digital elevation models • investigator targets**
- regional monitoring • stereo images • responding to environmental crises**

These data will be used in studies of

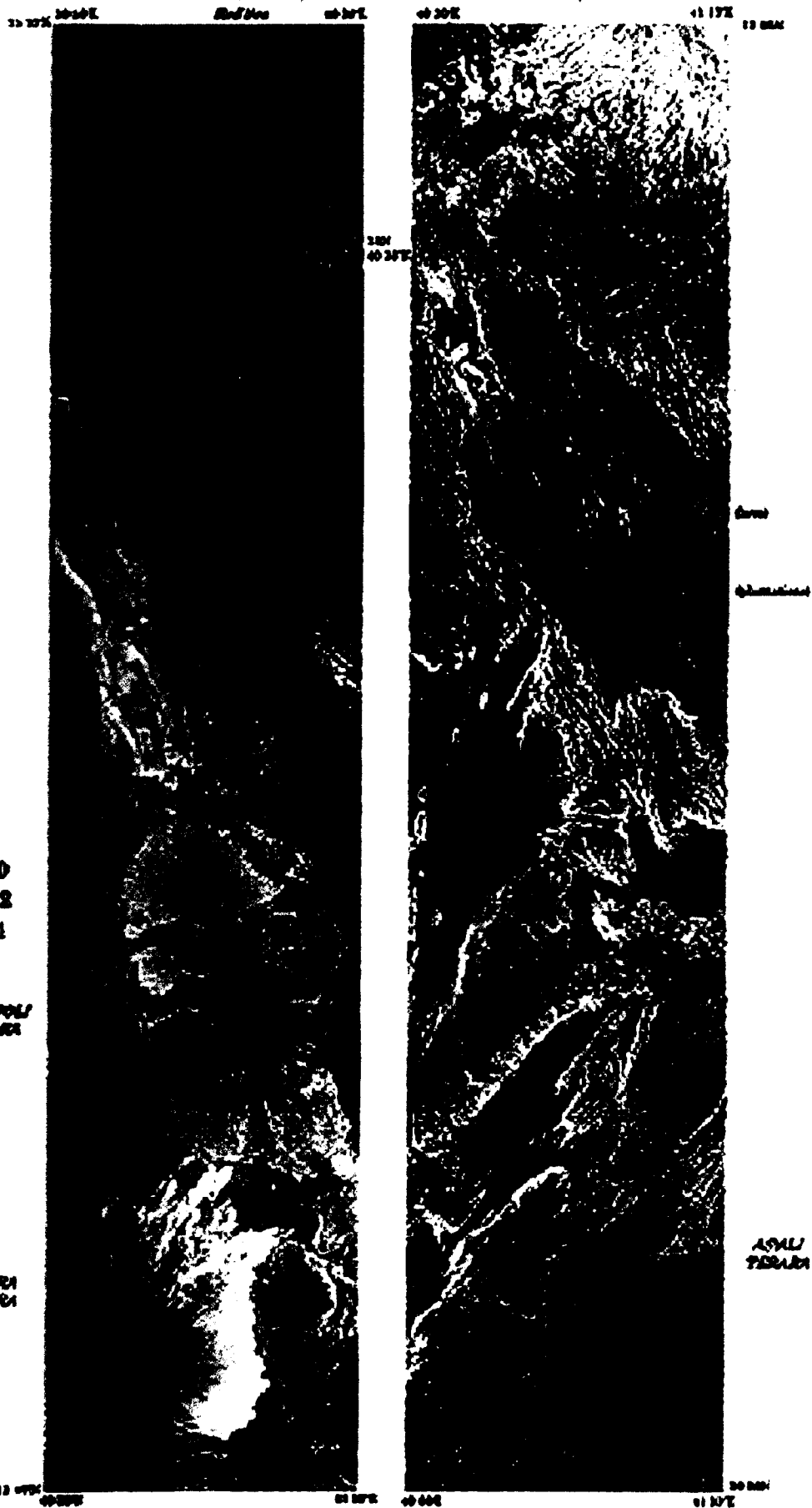
- surface change detection**
- surface radiation balance**
- evaporation and evapotranspiration**
- the hydrologic cycle**
- vegetation**
- soils and geology**
- surface-atmosphere interactions**
- volcanic processes**
- coastal processes**
- sea ice**
- clouds**

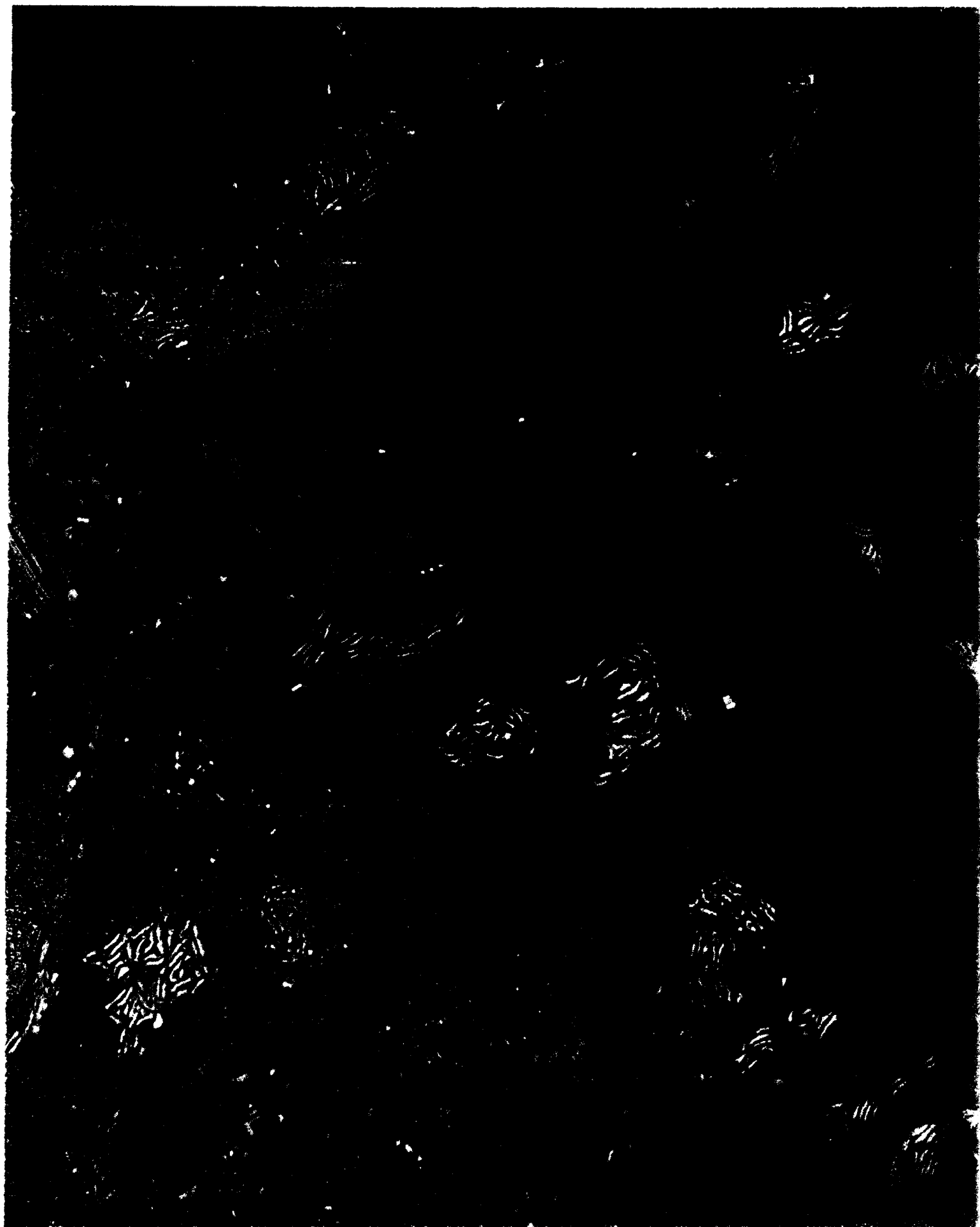


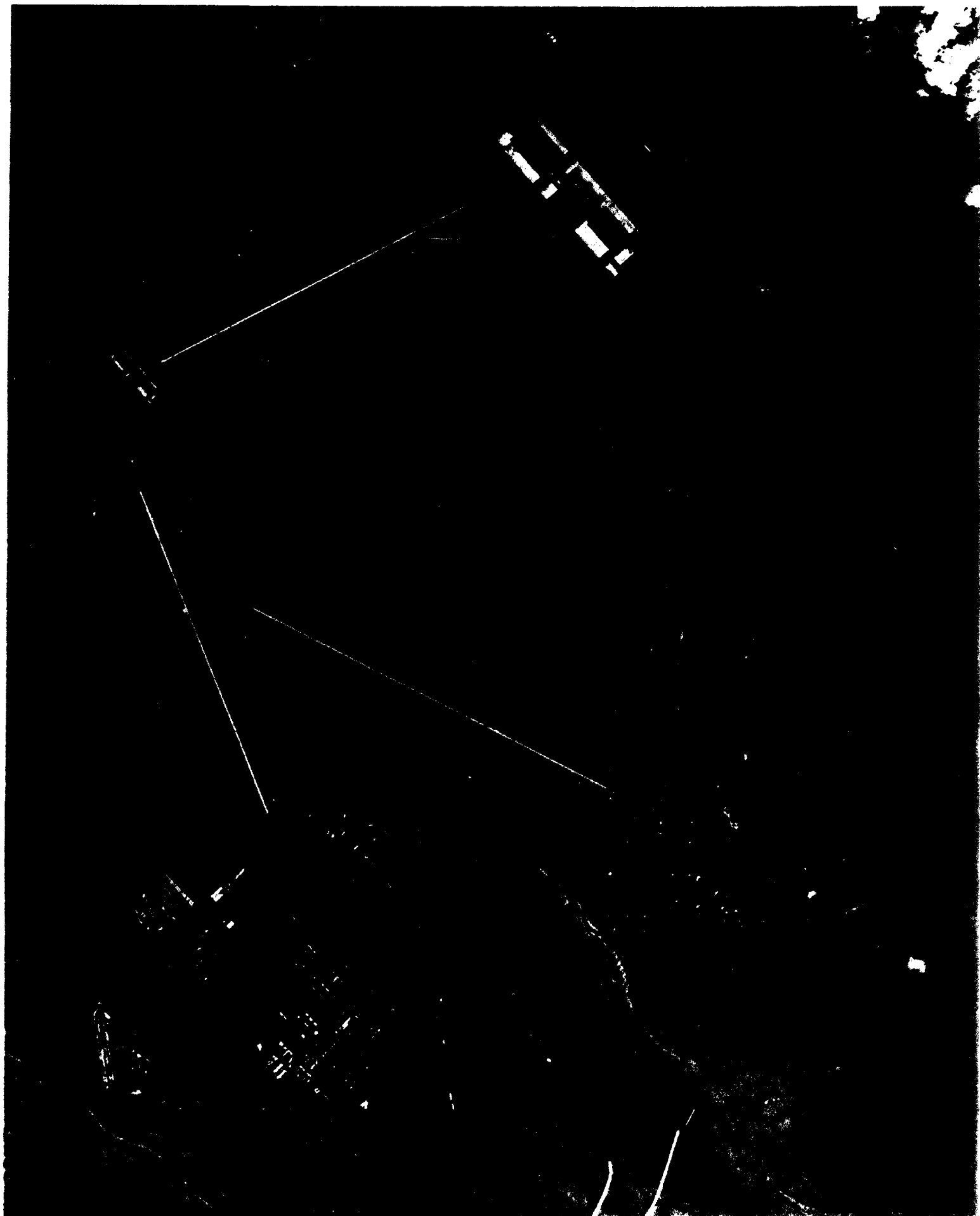
ASTER SPECTRAL BANDS



TIR(LOBI)DATA (ETHIOPIA area)











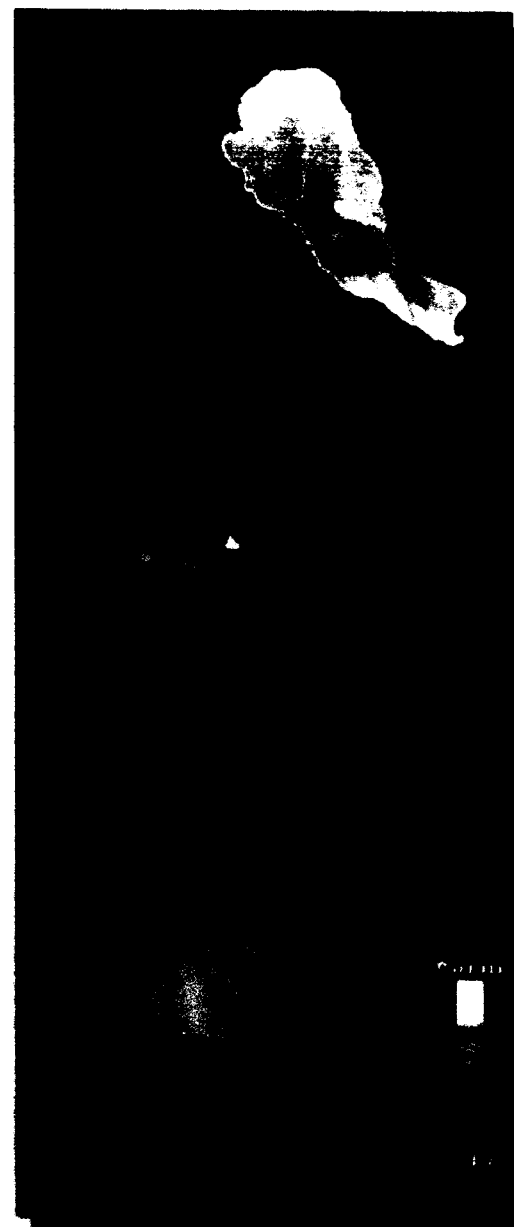
Lake Tahoe from ASTER



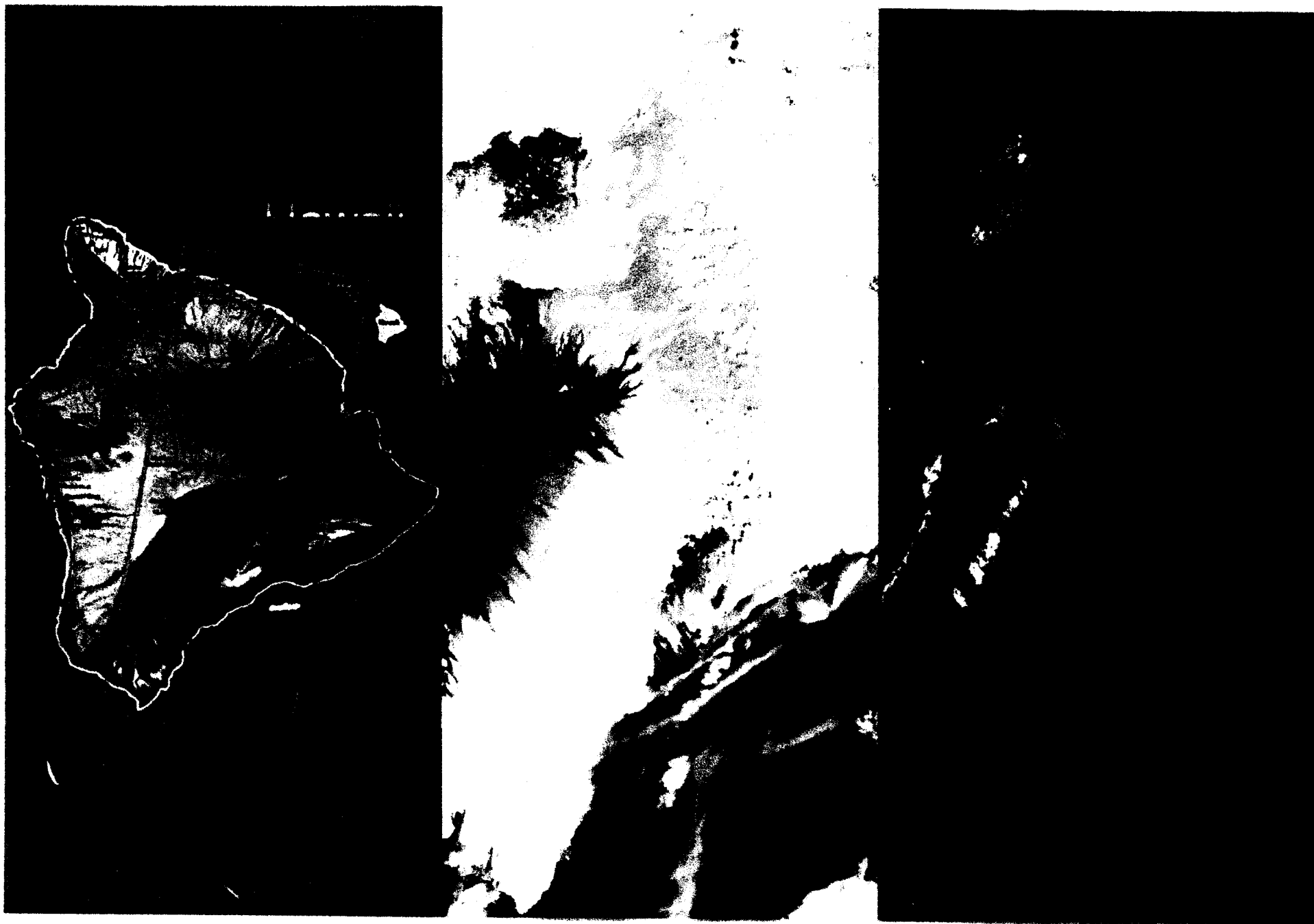
Visible-Near infrared



Thermal Infrared



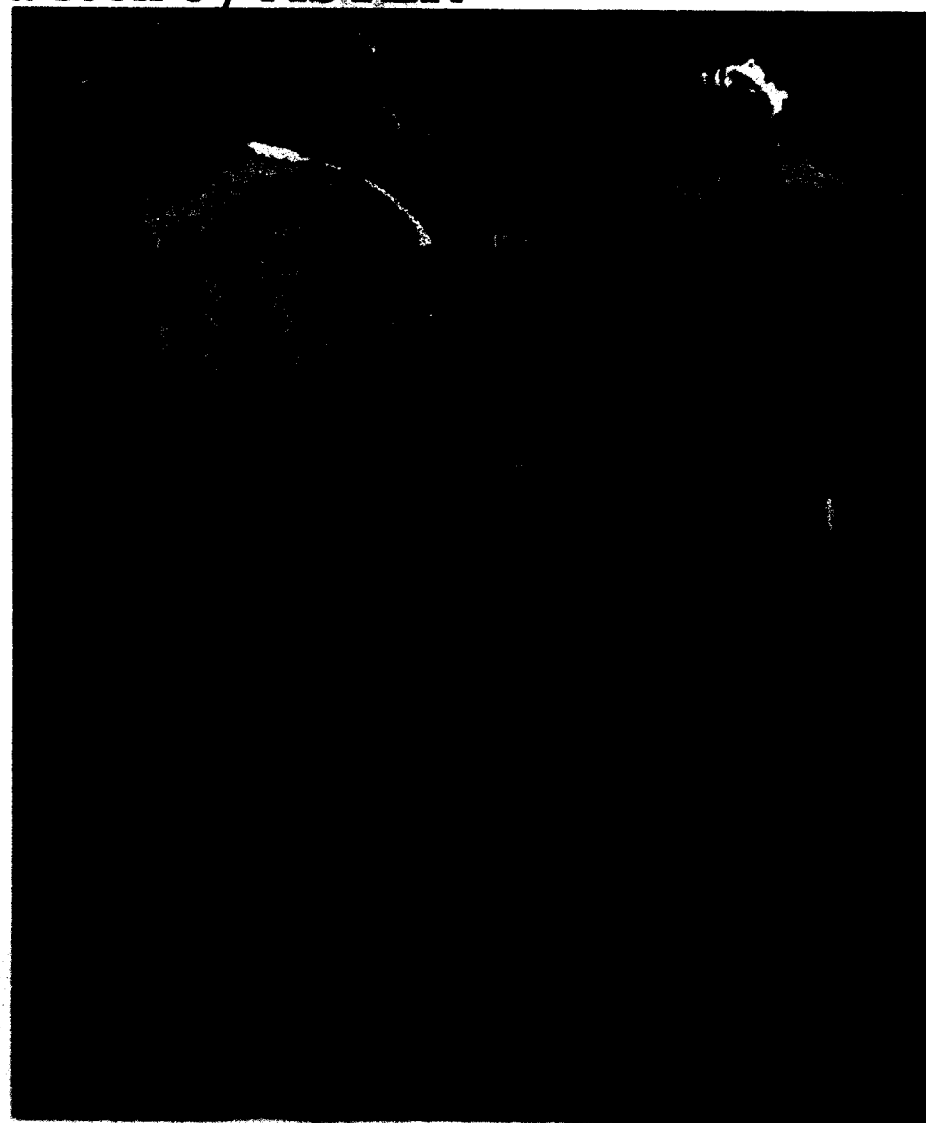
**Color coded TIR:
Temperature**



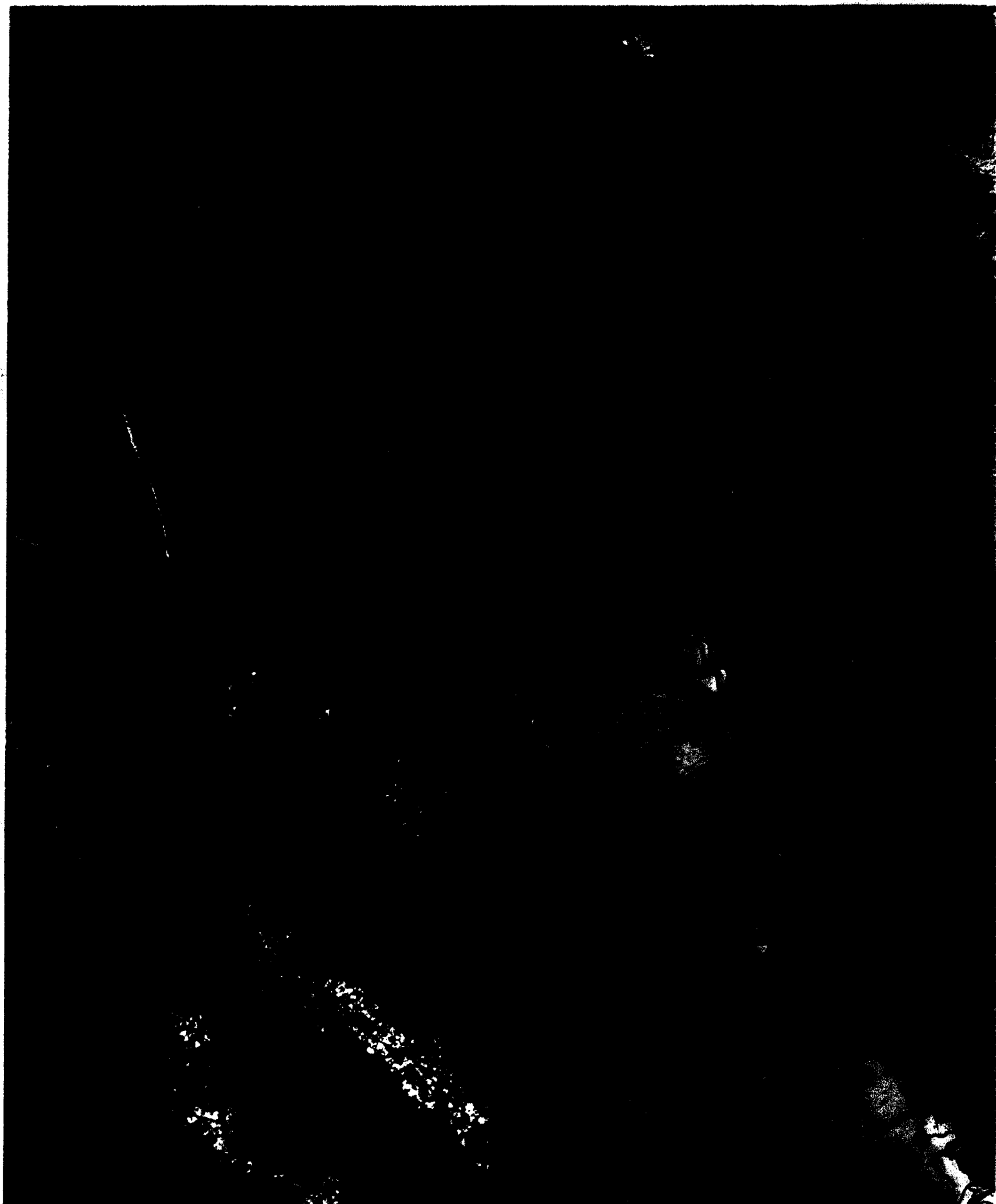
San Francisco area seen by ASTER

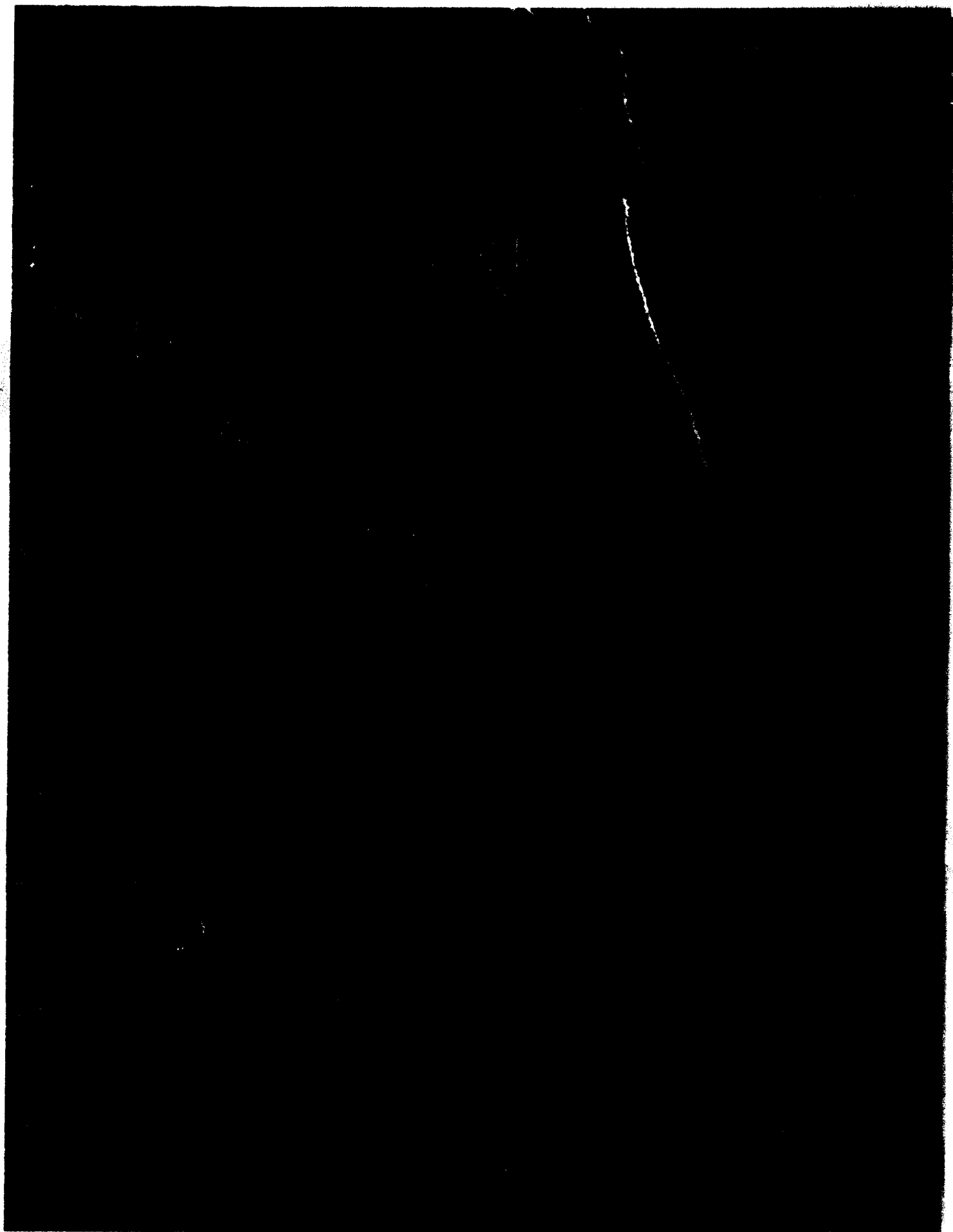


Visible and Near-infrared
RGB Composite

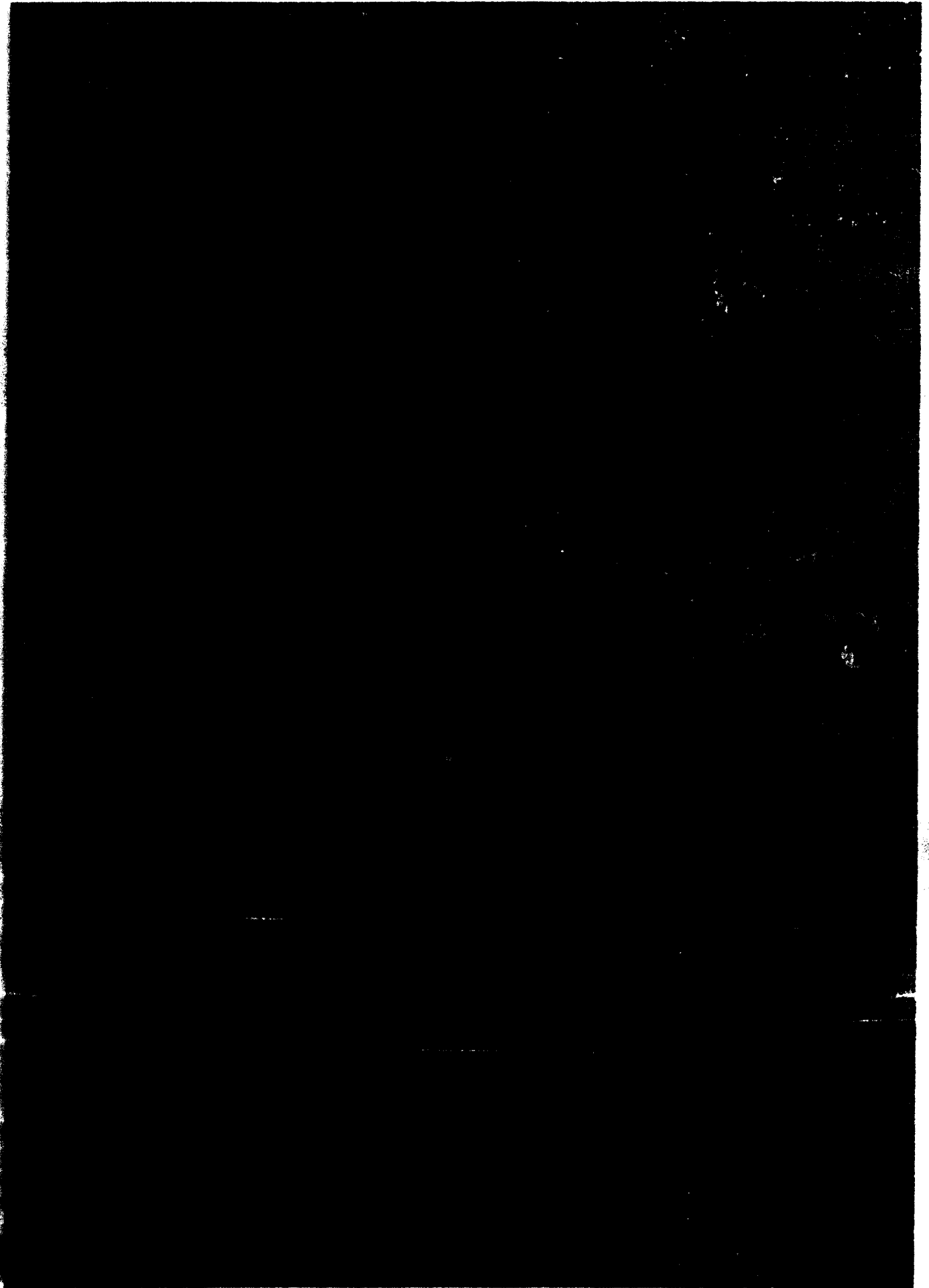


Color-coded Band 1, showing
relative suspended sediment load





Calcutta from ASTER



ASTER Instrument Operations

- Number of pointing changes over life of mission limited to 10,000 -- approximately 1 per 2.5 orbits for VNIR and SWIR
- Pointing changes to be made during nighttime part of orbit
- These limitations allow a maximum of 1.7 million scenes over the life of the mission

